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ABSTRACT

This paper examines the rapid changes in technology that enables cloning of human embryos and explores the issues related to teaching students about the use of such technologies. STS adoption has made only minimal impact on mainline social studies curriculum, although the topic has been included in discussion for decades. The paper outlines five possible barriers to more rapid adoption of STS content in the social studies and offers suggestions to surmount those barriers. Identified barriers include: (1) the crowded curriculum; (2) curriculum resources; (3) STS and controversy; (4) discomfort with science; and (5) low status for high technology. (EH)

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# THE DIFFUSION AND ADOPTION OF STS IN THE SOCIAL STUDIES: SOME OBSERVATIONS

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The headline proclaimed, "Researcher Clones Embryos of Human in Fertility Effort: Tough Ethical Challenge" (Kolata,1993), and within days radio talk shows and newspaper editorials were in the midst of a heated debate regarding the justification for cloning human embryos. A few days later Time Magazine made the cloning of humans it cover story. (Elmer-Dewitt, 1993) Apparently having the technology was one thing, using it was quite another, at least to some people who worried that we might be headed for a real-life version of the blunders portrayed in the film, "Jurassic Park". In the fall of 1993 the Public Broadcasting Service ran an eight hour series documenting the progress being made in decoding the millions of markers on human genes. With the introduction of President Clinton's national health care plan debate began over the extent to which certain medical procedures, which are possible with today's technology, should be rationed because of their costs.

It is difficult to ignore the almost daily examples of how new technologies bump into our existing values and policies. Technology shapes both our cultural and physical environments, but not necessarily in random or thoughtless ways, and that is the nub of the issue. How can we help students understand the

relationship between science, the technology it spawns, and the societies of the world? Furthermore, why is it taking so long for STS to find its way into the social studies curriculum in the United States?

## THE REAL AND THE FORMAL CURRICULUM

Admittedly the extent to which STS has penetrated the social studies curriculum is a matter of speculation (Giese, Parisi, Bybee, 1991) but the informal evidence is that the STS movement has had only minimal impact on main line social studies. This low level of STS adoption in the "real" curriculum is in spite of the fact that it is reasonably well represented in the "formal" curriculum. The National Council for the Social Studies was promoting STS as far back as 1956, when it devoted its 27th Yearbook to the topic (Cummings, 1956/1957). About twenty years later the Council established a standing committee to promote the study of STS issues and in 1983 and again in 1990 the Council endorsed STS curriculum guidelines developed by the committee (Science and Society Committee, 1990). During the 1980's the National Science Foundation supported three STS projects, including a national network to promote STS in science and social studies. Various journals and newsletters have featured STS, including recent articles in Social Education, (Heath, 1990; Smiddie, 1990) and two issues of Theory into Practice (Gilliom, Helgeston, & Zuga, 1991 and 1992). STS was deemed important enough so that the editors of The Handbook of Research on Social Studies devoted a chapter to the topic (Giese, Parisi, & Bybee,

1991). Currently the NCSS Task Force on National Curriculum Standards has proposed that one of its ten curriculum standards be devoted to STS (Task Force, 1993). Clearly at the formal level STS has been recognized as a topic worthy of note and one which seems appropriate for inclusion in social studies but we are left to speculate about why the diffusion and adoption rate remains so low where it really matters, i.e., in social studies classrooms.

A few months ago I advanced five hunches which I thought described the barriers to a more rapid adoption of STS content in social studies. (Marker, 1993) For the sake of argument let us assume that these speculations have some validity and approach them from the stand point of what could be done to surmount these barriers.

THE CROWDED CURRICULUM

> HUNCH # 1: There is no room in the social studies curriculum for yet one more topic, regardless of how worthy it may be. Global education, law-related education, drug and sex education; the list of topics competing for attention in social studies seems endless so STS simply gets lost in the shuffle.

This is a barrier that stands in the way of any new content proposed for that area of the curriculum that always seems to surface when it is time to wedge more important content into the curriculum. However, the thematic instruction movement provides an opportunity for STS topics to find their way into the curriculum, especially in the middle and junior high schools. The fact that most STS topics also include science and language arts content along with social studies makes them almost perfect

vehicles for thematic instruction. One can quickly think of topics like television, assembly line robots, or the microchip; each representing present day technologies which have changed and or changing our lives. They appear in novels and movies as well as in the everyday experiences of students. Channel One, now beamed into thousands of classrooms, probably deals with some aspect of these topics every week. But we need not focus only on contemporary events for our candidates for STS thematic topics. The domestication of the horse or the inventions of the stirrup or gunpowder or the airplane will serve just as well and ready made lessons exist to help jump start the process. (LaRue, 1988) STS today has some new and natural routes into the mainline social studies curriculum.

CURRICULUM RESOURCES

> HUNCH # 2: Textbooks determine much of what we do in social studies and current social studies texts do not include much STS content. Teachers with three or four preparations do not have time to design their own STS modules and are unaware of materials which have been developed by others.

I am presently concluding a study of factors which inhibit the adoption of technology in public school settings. It is clear that the lack of preparation and planning time for teachers is a MAJOR factor inhibiting their increased use of technology, and it is the reason many gave for their continued dependence on the structure of the textbook and related print materials. Unfortunately this situation is unlikely to change in the near term but there are some things we can do to assist teachers in

their present work situations.

There are STS lessons already on the shelf and ready to be used with a minimum of extra preparation time. The Social Science Education Consortium has prepared a loose leaf binder of STS lessons which department chairs could disassemble and pass along to teachers in the department. (LaRue, 1988). Tom Schneider Productions [1] has several computer simulations which involve STS topics relating to the environment, substance abuse, colonization, media ethics, and the campaign trail. All can be used in the "one computer classroom", making them within the technology reach of most social studies teachers.

Lee Ehman has described how social studies teachers use the Channel One broadcasts, a medium to which students are already attuned. (Ehman, 1991) Along those same lines, the people at Hawkhill Associates [2] produced a video series titled "Future Quest" on such STS topics such as the gene, nuclear power, global warming, toxic wastes, and energy. Most of the nine programs run about 30 minutes and appeal to the visual orientation of so many of today's students.

Increasingly teacher guides to textbooks are beginning to include bar codes keyed to laser disks. This device means that even teachers with limited technology skills will be able to call up full motion visuals related to topics in the text. The amount

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[1] Tom Schneider Productions, Inc., 80 Coolidge Hill Road, Watertown, MA 02172-2817.

[2] Hawkhill Associate, Inc., 125 East Gilman St., Dept. B, Post Office Box 1029, Madison, WI 53701.

of STS material in social studies texts may increase as a result of the attention given to STS issues in the social studies curriculum standards which are currently under development by the National Council for the Social Studies Task Force. (Task Force, 1993).

STS AND CONTROVERSY

The impact of controversial issues on social studies instruction has been a topic of discussion in social studies journals since the 1950's. While formal efforts to censor textbooks get most of our attention informal self-censorship is the most difficult to document and arguably the most effective in terms of keeping certain topics from being dealt with. That may well be the case in regards to STS, so my next speculation is:

> HUNCH # 3: Many contemporary STS issues such as genetic engineering, the safety of nuclear power, or holes in the ozone layer are currently areas of public controversy. Why involve students in topics where even the experts disagree? Historical STS issues are appropriate for study, but not those embroiled in controversy.

While I can't document that my hunch is correct logic would seem to support it. Why should teachers treat STS controversies differently from other controversial issues. In fact, many current STS issues are further complicated because they involve predictions about what will happen well into the future; predictions over which even those who should know disagree. Since many of the predicted "catastrophes" require short term sacrifices and/or lifestyle changes in order to avoid problems which are decades away the proposed solutions are often

questionable and unpopular and thus the subject of considerable controversy. That reduces the appeal of many STS topics to beleaguered social studies teachers.

There are, however, ways we can cope with the controversial aspect of STS. History is replete with examples where the facts are already in, where one need not deal with controversial predictions. How did the introduction of the steel axe alter social relationships in primitive societies? What happened to the Pony Express when the telegraph was invented? What impact did the invention of the electric automobile starter have on the role of women in the 1920's? What led to the invention of the catapult and how did it change power relationships among the nations of Europe? Why did steam power replace water power in the United States in the mid 1800's and what were some of the economic and social ramifications of that shift? These topics along with hundreds more can hardly be classified as controversial yet they provide us with opportunities to study the relationship between science, technology, and society. Sara Anderson has developed a comprehensive set of questions which students can ask as they study such historical events. (Anderson, 1984).

Even controversial topics become safer if we focus students on the relationship between technology and policy options. To return to my opening example, what are our options when it comes to controlling cloning research? What might happen if we adopt this policy as opposed to that policy? Where should we look for

what Robert Hanvey has called the "hidden wiring" in this issue? (Hanvey, 1975). Note that the emphasis is on how technology expands our policy options and on how public policy, which is controlled by humans rather than by technology, does make a difference in how we develop and use technology. To help students understand that we are not victims of our technology is quite different from teaching them that a particular technology (or technology in general) is either good or bad, moral or immoral.

DISCOMFORT WITH SCIENCE

My next speculation is based upon my contacts with hundreds of social studies teachers, both in pre-service situations as well as in their classrooms and at professional meetings.

> HUNCH # 4: Social studies teachers do not feel comfortable dealing with science content and since most STS issues involve some aspect of science social studies teachers feel it is better to leave them to the science teachers than to "get in over one's head."

This hunch is not intended as an implicit criticism of those of us in social studies. If my friends and I had loved science we would probably be in that field rather than social studies so it is understandable that we are not always that comfortable when topics take on a scientific flavor. We are much more comfortable discussing how environmental legislation is influenced during the congressional hearing process than we are in debating the technical merits of different types of land fills or incinerator designs. But there are ways we can compensate for our lack of scientific expertise.

The thematic instruction movement provides a perfect opportunity for those of us in social studies to cooperate with our colleagues in science. In the elementary schools topics such as energy, recycling, cultural adaptation, and nutrition, to mention just a few, provide opportunities to teach both science and social studies. (Marker, 1992)

I will admit that it is tempting to leave STS to the folks in science. Let the experts tell us whether residual growth hormones in our meat and poultry really pose a danger to human health. Let those who understand the science of the greenhouse effect decide whether we ought to stop cutting the rain forests of Brazil. But the experts do not always agree and in our system the people, average citizens if you will, finally must decide the public policy aspects of such issues. Can those of us who claim that preparing young citizens is at the heart of our mission simply ignore this growing body of STS issues without undermining our very reason for claiming a share of the curriculum?

LOW STATUS FOR HIGH TECHNOLOGY

> HUNCH # 5: Technology involves understanding how things work and such applied knowledge does not have high status with people interested in academic matters. In fact, it is rather fashionable not to need to understand how things from dishwashers to computers work, leaving that to repair persons and technicians.

This final speculation is the one with which I am most uncomfortable because if it is true I really do not know what to propose. This speculation was prompted by an article by Cecily Cannan Selby (Selby, 1993). Increasingly we are surrounded by

machines and procedures which to the average person seem almost magic. What makes a microwave oven work? What happens when we turn the key in our car's ignition? How can photovoltaic cells generate electricity from sunlight? What makes gene splicing work? Increasingly we are at the mercy of technicians, scientists and engineers who know how things work and who can "fix them" when they stop working. Like it or not we are becoming increasingly interdependent, keeping our world working now depends on a host of specialists and experts. To pretend that knowing how our world works is unimportant is one thing. Time will tell how popular the new TV series titled, "How Do They Do That?" proves to be. But what about the notion that it is becoming academically fashionable to interested in more important things than understand how dishwashers or CAT Scans work? As a society can we really afford to create a priesthood of low status repairpersons and high status experts to whom we leave the management of these "things" which make our lives easier? I doubt it, but I leave it to others to help invent ways to combat such a development.

CONCLUSION

In summary, I believe it is possible to explain why the diffusion of STS content in the social studies curriculum has been so slow and uneven. But there are ways around most of the barriers I have discussed and we need to work around the barriers rather than be defeated by them. We are making progress but we have yet to round the bend of the STS "J curve", though that time

will come.

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